



## THE SCARCER HALF

A report on amniocentesis and other Sex-determination techniques,  
Sex preselection and new reproductive technologies.



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A report on amniocentesis and other Sex-determination techniques,  
Sex pre-selection and new reproductive technologies

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## CONTENTS

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### I. INTRODUCTION

### II. AMNIOCENTESIS

- a) What is amniocentesis
- b) Risks
- c) Sex ratio
- d) Amniocentesis as a tool for family planning

### III. SEX-DETERMINATION

- a) Attitudes
- b) Acceptance

### IV. NEW TECHNIQUES

- a) Research in sex-determination techniques
- b) Sex pre-selection
  - 1. In ayurveda
  - 2. Present knowledge and new techniques
- c) New reproductive technologies

### V. CONCLUSION

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## CONTENTS

---

I.	INTRODUCTION	1
II.	AMNIOCENTESIS	2
a)	What is amniocentesis	2
b)	Risks	3
c)	Sex ratio	3
d)	Amniocentesis as a tool for family planning	3
III.	SEX-DETERMINATION	4
a)	Amniocentesis	4
b)	Amniocentesis	4
IV.	NEW TECHNIQUES	5
a)	Research in sex-determination techniques	5
b)	Sex pre-selection	5
c)	In vitro	5
d)	Present knowledge and new techniques	5
e)	New reproductive technologies	5
V.	CONCLUSION	6

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## I. INTRODUCTION

Three years have passed since the controversy surrounding North India's first commercial pre-natal sex determination clinic run by Dr. Bhandari of Amritsar originated, quickly ascended and eventually ebbed. The thousands of words written on it, in the national and regional press, in the form of editorials, news items, interviews, letters to the editor and analytical articles, lie buried in newspaper files. However, far from being resolved, the issue has assumed gigantic proportions thanks to the inaction on the part of activists, intellectuals and the press.

This counterfact is an attempt to re-initiate the debate on the issue of foetal sex determination (S.D.) in a wider and contemporary context. It raises the issues of sex pre-selection and new reproductive technologies (NRTs). It has been prompted by the following trends:

- i) A very rapid increase in the use of amniocentesis exclusively for foetal sex determination and consequently for female foeticide
- ii) Inaction or veiled acceptance of this trend by health professionals and the government
- iii) Advances in the technology of foetal sex determination and pre-selection which promise simpler and safer techniques
- iv) Emergence of Ayurvedic methods claiming to 'ensure' a male child

This report does not intend to be an update on amniocentesis and other related issues. First and foremost, it is an attempt to break the three year old silence. It seeks to attract the attention of all concerned to the gravity of the situation today. It intends to trigger off fresh thinking on the issue and initiate a debate on various inter-related issues.

Although some S.D. clinics in Bombay and in mofussil areas are surveyed personally, the data collected by the author is limited and he has relied heavily on published works.

Lastly, this work does not claim to be a neutral study. Essentially it is the view-point of one who is concerned and committed to women's liberation and equality.



## II. AMNIOCENTESIS

### a) What is Amniocentesis

Amniocentesis (*Amnion*: membrane, *Kentesis*: pricking) refers to the removal of about 15 cc of amniotic fluid (from inside the amniotic sac covering the foetus) through a long needle inserted into the abdomen. The amniotic fluid contains foetal cells which are separated from the amniotic fluid. These cells are then either directly observed or are allowed to multiply in a nutrient broth or tissue culture for four to five weeks for chromosomal analysis. The former method, though less reliable, is usually followed as it is a quicker method.

Chromosomal analysis for sex determination involves checking for the presence of a stainable dot in the nucleus of the cells. The spot (or more accurately body) known as Barr body is usually present in females and absent in males. Another test, using a dye called Quinacrine looks for what is called fluorescent F bodies in the nucleus. These stains can be observed through a fluorescent microscope under an ultra-violet or laser beam. The presence of these bodies indicate a male foetus.

The technique of Amniocentesis was originally developed for the detection of over 70 genetic diseases (most of which are serious) by direct chromosomal study of foetus cells. Sex determination by chromosome analysis was done when a sex-specific disease was considered possible and where no other pre-natal test was available. A case in point is haemophilia\* or Duchenn muscular dystrophy\*\* where the mother may be a carrier of the disease, but can affect the child

only if it is male. In such cases, if a male is detected, the doctor/patient has the option to abort the foetus although half of them would have ultimately turned out to be normal.

Thus, foetal sex determination originated as an offshoot of an important and useful clinical tool. Infact, it was used at the All India Institute of Medical Sciences (AIIMS), New Delhi and the Institute for Research in Reproduction (IRR) and the Harkisandas Hospital, Bombay for about 5-6 years without drawing any particular attention. It was only in July 1982 that the controversy broke out, when an error in the analysis resulted in the abortion of a male foetus by Dr. Bhandari of Amritsar.<sup>1</sup> By that time, several such clinics had sprung up in cities like Bombay, Meerut and Kanpur. The controversy and debate to which the press, women's groups, population experts, intellectuals, health professionals, and government contributed their share, lasted barely a few months.

### b) Risks

Amniocentesis can cause damage to the foetus and placenta resulting in spontaneous abortion and premature labour. It can also create problems like hip dislocation and respiratory complications. There is also the risk of infection in the reproductive tract if aseptic procedures are not strictly followed during incision and the piercing of the amniotic sac.<sup>2,3</sup>

Doctors practising amniocentesis are not known to give a clear picture of all these potential dangers and risks to the

\* Haemophilia is an inherited disease in which blood clots improperly. Haemophilics are almost invariably males.

\*\* Dystrophy - abnormal development, degeneration.



patients. A study<sup>3</sup> of 242 cases conducted by the Voluntary Health Association of India (VHAI) states that the chances of premature delivery are 4 per cent, a fact not mentioned by most of the doctors; other risks are also underplayed. For instance, an Amritsar based clinic reports<sup>4</sup> that the risk of abortion is 0.1% whereas VHAI estimates is at 1.5%.

But, the most important fallout of this technique relates to the increased incidence of abortion that occurs when the foetus is found to be of the undesired sex. This also has hazardous implications because amniocentesis is ideally performed during the 14 or 15th week of pregnancy and so the abortion can only be done in the 2nd Trimester. Abortion at this advanced stage is considered risky and difficult. Superimpose this on the fact that about 70% of Indian women are anemic, the percentage being higher among pregnant women from the poorer sections of society. Besides, every year about six million women in India resort to illegal abortions by quacks.<sup>5</sup> All these lead to the statistic that India has the 2nd highest maternal mortality rate in the world (400-500 per 1,00,000 live births).<sup>6,7</sup> Increased use of Amniocentesis resulting in repeated abortions is likely to take this figure even higher.

### c) Sex Ratio

Amniocentesis, as a tool for sex determination is almost always followed by abortion if the foetus is female. A study of 8000 cases of abortion showed that 7999 of them involved a female foetus.<sup>6</sup> Widespread use will adversely affect the sex ratio, which is even now tilted against females (935 females to 1000 males - 1981 census).

The counter-arguments by some doctors practising amniocentesis are based more on prejudices relying on what they call "nature's own mystified way of checking

imbalances" than on data or facts. According to them, people resort to these techniques only if they already have one or two daughters. While this is not necessarily true, it is also clear that no person would undergo sex determination to abort a male foetus if they already had one or two sons. Another interesting jus-

Another interesting justification is that sex pre-selection will reduce the number of unwanted and hence neglected female children, and that an adverse sex ratio will, according to the law of demand and supply, elevate women's status in society and eliminate evils like dowry.

But, Leela Dubey, in her study<sup>8</sup> of societies having an adverse female sex-ratio, points out that customs like polyandry, sharing a wife (outside wedlock), abduction or purchase of women are prevalent in such societies. Besides it can be argued that adverse sex ratios may in fact lead to an increase in the incidence of rape, prostitution and greater controls over women.<sup>9</sup>

In India, female mortality was 60% higher than that of males in the age group upto 5 years. Today, however, we find that the same mortality ratio exists upto the age of 8 or 9 years and this when the sex-ratio is continuously declining.<sup>10</sup> This indicates the prolongation in the period of neglect of girls, and proves that a decline in the sex-ratio does not necessarily lead to better care of women. In fact, in states like Tamil Nadu, Kerala and Andhra Pradesh, which have deviated from the trend of declining sex ratio against women, women are known to take a more active part in productive activity and daughters are treated much less harshly than elsewhere.

### d) Amniocentesis as a tool for family planning

The most favourite argument of doctors

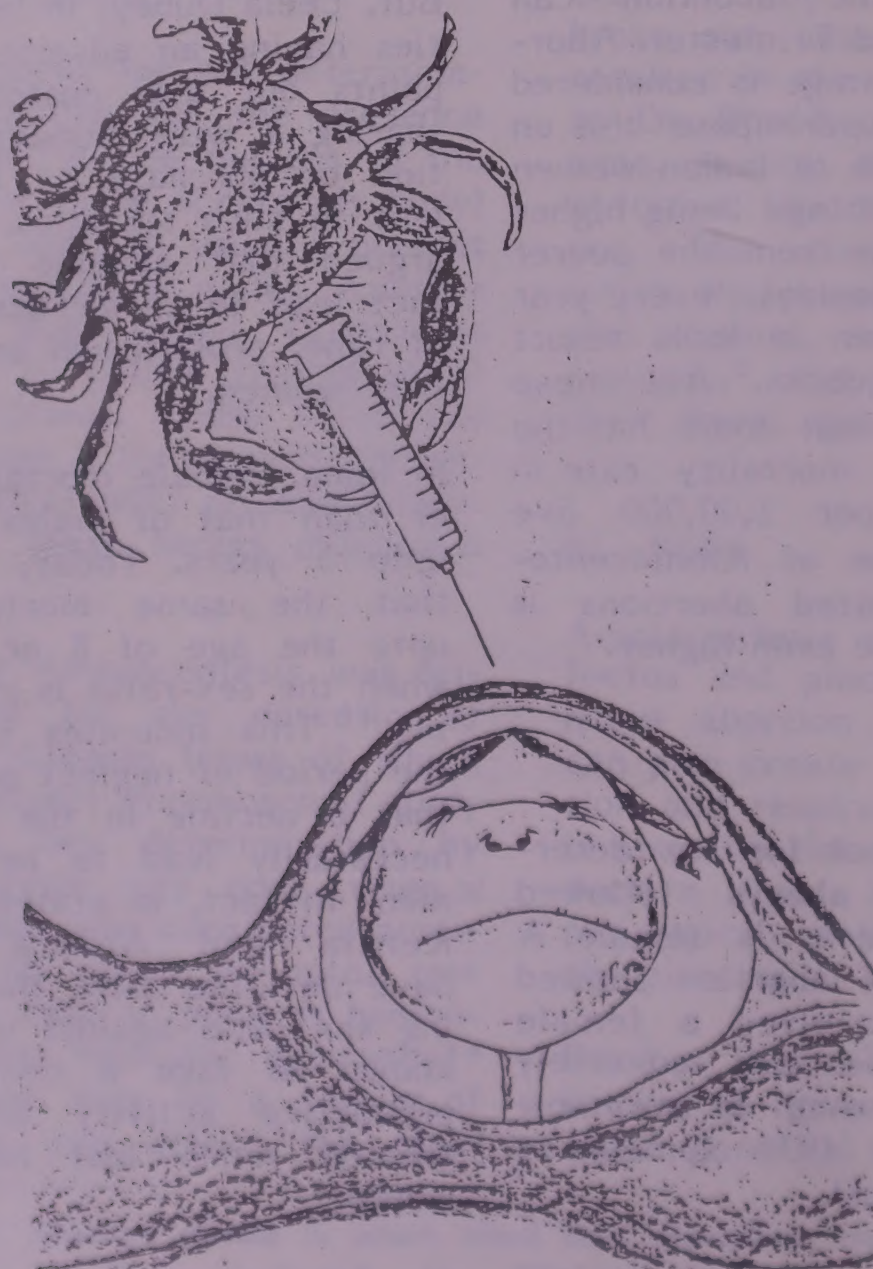


practicing amniocentesis is that it is an effective tool for family planning, the logic being that couples will stop production once they get a son. It is this belief that has led the government and other authorities to turn a Nelson's eye to the malpractices and hazards associated with sex determination. Some doctors have even gone to the extent of suggesting that amniocentesis be made available free or at least at concessional rates.

This argument however does not seem to take into account one simple fact, which is that sex determination tests do not guarantee the birth of a male child. They

merely ensure multiple abortions (i.e. abortion of every second foetus tested for its sex) which can cause immense harm to women's health.

Women are being increasingly singled out as target groups (and as a result, victims) for family planning and amniocentesis is a part of this trend. Lack of food, clean drinking water, economic security and safe clinical facilities have led to a situation where a woman has to have 6.2 children to ensure one surviving male child.<sup>11</sup> Hence people's 'desire to have a male child' is not the real reason for deviation from the small family norm.





### III. SEX DETERMINATION

#### a) Attitudes

The widespread use of sex determination tests, coupled with the prevalent objective of population control "by any means" (even if it involves 'femicide' or 'female infanticide') only reinforces the sex-stereotypes prevalent in our culture. So much so, that preposterous arguments like "amniocentesis will help reduce the misery of women, who would be abused by angry husbands if they gave birth to females", have found their way into print. Far more ridiculous is the claim that sex-determination would enhance "women's freedom of choice" or "women's rights to control their bodies".

The state tries to decide the number of children a couple can have, and social customs and conventions select their sex. The medical profession, a strong arm of the patriarchal value-system, not only abets in female foeticide, it also permits it in the more risky months of pregnancy, justifying it by saying that the girl would probably have lived a tough life anyway! So much for medical ethics, which on the other hand refuses to let go terminally ill old patients who have lived their life fully, and have only pain to suffer.

On the legal front many questions are thrown up. Isn't the equality of sexes, which is guaranteed by the Constitution subverted by this practice of preventing the birth of one sex on a mass scale? Shouldn't it be considered illegal to allow abortion in the 2nd trimester, without any medical reasons?

Today, a few individuals are demanding a complete ban on amniocentesis. The majority of them however, including health activists, medical personnel etc. feel that there should

be a ban only on its use for sex determination, as there are also positive benefits of amniocentesis (as a test for foetal abnormality). This seems to be a rational view despite the argument that the SD tests can then be done through amniocentesis surreptitiously.

Speaking at a conference of regional health ministers, the then Union Minister for Health, Mr. B. Shankaranand "expressed deep concern" over the "highly unethical, unjust and immoral" practice of using amniocentesis for sex determination.<sup>12</sup> However, in the Lok Sabha, he ruled out a total ban on amniocentesis, saying that it is for the people to change their attitude to female children.<sup>13</sup> Meanwhile his promise of closing the Amritsar clinic also remains unfulfilled. According to the Minister, the government is not aware of the misuse of this technique in Delhi.

The overall indifference of the Government is hardly surprising in view of the opportunism inherent in its policy of population control. Given the problems associated with oral contraception, and the low popularity of vasectomy, amniocentesis may seem a workable tool. Thus government patronage to amniocentesis in the form of subsidies or training or facilities cannot be ruled out.

The press by way of articles, reports and editorials in periodicals and newspapers condemned the practice of amniocentesis for sex-determination. Yet they continued to print advertisements of such clinics. Some leading newspapers blamed women, especially Indian women for being "crazy for a son" and remarked that the "women, after all, are the worst enemies of women".<sup>14</sup>



In fact this sentiment was expressed by many women intellectuals. Some women doctors seem ready to use the test on themselves and their near relatives, indicating the extent of internalisation of sexist and patriarchal values in society despite their so-called higher education and social status.

These values finally reflect their resistance to larger issues, like peoples control of science and technology, in general, or the question of women's control of their bodies, their role in decision making and women's health in general.

During the earlier controversy, these issues were not taken up seriously by activist groups in the field of voluntary health, peoples science movements, science & technology institutions, human rights groups etc. No sustained attempts were made to take up the issue of amniocentesis with other problems like hormonal contraception, hormonal drugs for pregnancy testing, research in sex pre-selection and genetic engineering. Besides very little data regarding the spread of this technique, motivation of patients and risks and limitations of the technique etc. was brought forward.

Section IV of this publication makes an attempt to fill this gap and discuss the enhanced dimension of the problem in view of its widespread use and increased popularity.

#### b) Acceptance

Quantitative data regarding the number of S.D. clinics and/or patients is virtually non-existent. We have therefore personally surveyed clinics in Bombay and Dhule (a district town in northern Maharashtra). It is very clear that pre-natal sex determination centres have proliferated in the last three years.

Most leading gynaecologists in Bombay offer 'this service', which has become a routine practice in maternity homes and abortion clinics. In Bhandup (a suburb in Bombay) alone, there are three clinics within a radius of one kilometre. Most of these clinics only extract the samples from pregnant women and send them to specially equipped centres for chromosomal analysis. The number of such centres in Bombay has gone up from about three to at least 20 in the last three years. The larger of S.D. clinics easily perform about 1500 amniocentesis tests a year.

Dhule town, which has a population of 2.5 lakhs and was ignorant of amniocentesis three years ago, now has five clinics. The most established of them has handled 450 cases in the last one and a half years. Amniocentesis clinics have also come up in other towns in Maharashtra, like Jalgaon and Amravati. All these clinics send their samples all the way to Bombay for chromosomal analysis. Since these clinics don't keep any systematic record of cases, it renders any statistical compilation, especially that regarding side-effects of the technique, almost impossible.

One doctor who has handled about 450 amniocentesis cases said that the rate of spontaneous or delayed abortions is about 10%. This rate, which is extremely high even after accounting for living conditions in rural areas, is only likely to increase as unskilled and semi-skilled doctors enter the fray to make a fast buck. There is also immense pressure from patients on most doctors to perform amniocentesis. In fact, some doctors remarked that they had to perform amniocentesis to "remain in business".

Sex-determination is fast becoming big business. In the rural areas they pay not



only for taking the sample and chromosomal analysis but also for conveyance and handling. The view is, "It is cheaper to spend Rs. 500/- today than to spend thousands, years later."

The profile of patients has also been changing in the last three years. The first to be attracted to the technique were communities (like the Marathas, Marwaris and Lewa Patils) in which dowry is rampant and where sex stereo-typing is rigid. Today amniocentesis and subsequent abortion of the "wrong sex" has gained the acceptance of upper castes and the white-collared middle-class people, who used to be quite fussy about abortion. According to an experienced doctor, there is a growing enthusiasm for sex-determination tests among these people after one or at the most two daughters, as against the rich middle-class who take many more chances.

Today, if you sit in any local train in Bombay, you will see at least one advertisement for pre-natal sex-determination. Huge display hoardings and pamphlets and evening paper advertisements confront you, as if telling you that the day of low-key activity and controversy are over. Gossip columns speak of

sex-determination tests on Hema Malini and Prince Diana, while slum dwellers take a loan at exorbitant interest rates to pay for these tests.<sup>15</sup>

In almost all cases, amniocentesis is used for foetal sex determination. In fact, most patients coming for amniocentesis do not even know that it can be used for detecting foetal abnormalities. Of the more than 1000 cases reported from Bombay, not a single case of abortion of a male foetus was reported, whereas 97% of the foetuses identified as female have been aborted.

One analysis of 118 cases from a clinic in Bombay showed that 12% women had one living son and 10% women had not more than one living daughter (i.e. those who have none or just one daughter). Out of the 172 cases studied in another clinic 11.6% of the mothers had one son and 16.2% not more than one daughter. Meanwhile, a leading population expert is also reported to have encountered cases of women aborting their first or second pregnancies of the wrong sex.<sup>16</sup> From this it is clear that amniocentesis is used not only for minimising the number of daughters, but also for increasing the number of sons.



## IV. NEW TECHNIQUES

### a) Research in Sex Determination Techniques

Even as amniocentesis is becoming the most popular method of sex determination of the foetus, new techniques are being developed both in India and abroad. Some of them may soon substitute amniocentesis, as they involve less risks. A few of these methods are described below.<sup>17</sup>

#### 1. Chorionic Villi Biopsy

This method involves the removal of the elongated cells (villi) of the chorion (tissue surrounding the foetus), through the cervix. This tissue is tested with DNA probes or by sex chromatin studies. This new biotechnology enables sex determination between the 6th and the 13th week. Abortion, if desired, can then be carried out in the first trimester itself, with greater ease. Claimed to be less painful than amniocentesis and 100% accurate, this technique carries a 3 to 5% risk of bleeding, pain and spontaneous abortion.

#### 2. Ultrasonics

This method (also called Sonography) uses inaudible sound waves to get a visual image of the foetus on a screen. Normally employed to determine the foetal position or abnormalities, the technique can be used to determine sex if the external genitalia of a male foetus is seen on the screen. A study, in Australia, of 137 fetuses said that 66% of the foetus scanned between the 24th and 30th week were positively identified with a 2% error. In Sweden, diagnosis could be made in 74% of 101 fetuses studied with 3% error. This method though safe, is not generally used for sex determination as detection is possible only in advanced stages of pregnancy and the

results are not definitive.

#### 3. Foetal cells in maternal blood

Certain cells in the foetus, like Lymphocytes (a type of white blood corpuscles), can cross the placenta and enter the mother's blood. After the 10th or 12th week of pregnancy, if the blood is tested with the help of fluorescence-activated cell sorters, it can indicate the sex of the foetus. Though current reports on the use of this method from Finland, Belgium and USA are equivocal, the method, if made more reliable, can make sex determination easy, safe and quick.

#### 4. Presence of Testosterone

A similar method involving the testing of the mother's blood involves the presence of Testosterone (a sex hormone produced by the testes of the male foetus) which finds its way into the maternal blood. Here the problem is that testosterone is also produced in the maternal body thus making determination ambiguous.

The difference in levels of testosterone in the amniotic fluid can also determine sex. This method however means getting the fluid through amniocentesis and its accuracy at present is not more than 70%. Results however are quick (one day after amniocentesis).

#### 5. Sex-selection among test-tube embryos

In recent experiments in mammals, it has been found that the whole animal can still be formed even if a few of the early divided cells are removed. This means that it is possible to take a few cells from the test tube embryo and test it directly (by chromosomal analysis as explained in the chapter "What is amniocentesis"). The remaining cells can be destroyed if found to be



of the 'wrong sex'.

Similarly, efforts are underway to separate sperm bearing chromosomes of a 'desired sex' so that only these can be fertilized.

As simpler and safer methods are evolved, risks, late detection and abortion will no longer be associated with sex-determination and selection. Opponents of sex determination may have to draw their battle lines more on ideological than on technical or medical grounds. The task ahead, therefore, are more formidable.

#### b) Sex Pre-Selection

"It pays the poor to have all sons. Help the poor to reduce the number of unwanted children...."

These words appeared in an advertisement in the *Educational Review*, Madras. Inserted by the *Indian Librarian*, Jullunder, the advertisement was promoting a free book 'Sons by Choice' which discusses eight ways including sperm analysis, and the blue pill (Invitroson).

There is also an ayurvedic drug "SELECT" in the market. The promotion literature reads

"THANKS A LOT TO MEDICAL SCIENCE! PUNSAVAN PRAYOG, the ancient ayurvedic treatise helps break the female heredity and bless the couple with their long cherished desire to have a male child. YES DOCTORS can ensure their patients joy and satisfaction".

Whatever be the merits of these claims, there is no denying the fact that vigorous attempts are being made by modern medicine to devise a fool proof method of sex pre-selection. Animal studies are reported to have been successful in this

regard and, given the rapid progress in New Reproductive Technologies, a breakthrough is only a matter of time.

The issue of sex pre-selection has thus become inseparable from that of foetal sex determination as developments in modern methods and a revival of ancient indigenous methods, make sex selection an everyday reality. The resistance to it must increasingly rely on ideological (feminist and humanistic) arguments.

#### 1. Theories of Sex Pre-Selection in Ayurveda

Several theories suggested in standard Ayurvedic texts written centuries ago are still accepted as authorities by exponents of Ayurveda today.<sup>18</sup>

Revolving around the general premise that the sex of the foetus is determined between the first and the fourth months of pregnancy, Ayurvedic science goes on to elaborate on the various factors acting as determinants.

Character attributes specifically generated within the foetus, by the parent is one of the factors that clearly shows the male sexist bias prevalent in this science. Whereas attributes of cowardice, weakness, lack of specificity of knowledge and unsteadiness, generated within the foetus are held to be the contributors towards a female child, qualities like strength, stability, and purity of knowledge lead to male issue!

The relative strength of the sex unit (egg or sperm), the day of conception (even nights from the 4th to the 16th after the commencement of menstruation for a male child and "odd" nights for a female),<sup>19</sup> and other religious rituals (like PUNSAVANA<sup>20</sup> - "begetting a male" - recommended for the 1st pregnancy of the woman, performed before the foetus begins to move, when the preg-



nancy is visible and the moon in the Tisya constellation), a currently practised ritual even in Bombay, are some other examples.

According to Ayurveda, another factor responsible is the nature of the dominant 'Nadi' in the vagina. There are three possibilities: if during fertilisation, the semen falls over the 'Samirana', there will be no conception; a woman with a dominant 'Chandramasi' is easily sexually satisfied and usually gives birth to daughters; and the one with a pre-dominant 'Gauri', nadi takes time to reach orgasm, but usually conceives sons.<sup>21</sup>

Various other non-religious rituals are also practised within this science to beget a male. From consuming two (east and north facing) protrusions (shungas) of the banyan tree mixed with mustard and curds on the 'Pusya' constellation, to drinking 'kudyakeet' (a small worm) with water on the Pusya constellation, the possibilities are endless!

Other practised methods include consuming a red-hot statue of a man made of gold, silver or iron added to milk, curds or water.

## 2. Present Knowledge & New Techniques

Each human cell contains 23 pairs of chromosomes (gene-carrying material in the nucleus). Of these, 22 pairs are responsible for all hereditary character whereas the 23rd pair determines the sex. All male body cells contain one X-chromosome and one Y-chromosome, and all female cells contain two identical X-chromosomes. Thus every female gamete contains one X-chromosome, while a male gamete can contain either an X- or Y-chromosome. The fertilization of an X-bearing ovum with an X-bearing sperm results in a female, and that of an X-bearing ovum with a Y-bearing sperm, a male. Thus it is clear that any method aimed at sex

pre-selection should intervene before fertilization. Research on sex pre-selection has mainly focussed on the following areas.

- i) In-vitro (outside the body) separation of X- and Y-bearing sperms
- ii) Timing of insemination in relation to ovulation
- iii) Immunising females against Y- or X- bearing sperms
- iv) Altering conditions in the female reproductive tract
- v) Pre-natal sex determination and abortion of foetuses of the unwanted sex
- vi) Miscellaneous.

### i) Separation of X- and Y- bearing sperms:<sup>22</sup>

Much of the earlier work in this field was done by cattle breeders using artificial insemination. The pace of research could not pick up until a simple in-vitro staining technique to directly differentiate between X- and Y- bearing sperms was made available. Methods of separation based on properties like specific gravity have met with varying degrees of success. Despite the claims of some scientists, no fool-proof method has as yet emerged. The reason for this is that the small differences in the physical properties of X- and Y- bearing sperms are obscured by greater variations among individual sperms, different ejaculates from the same donor and among sperms from different donors.

The following techniques are used for this purpose -

- a) Separation by sedimentation or centrifugation: X- bearing sperms contain 3-4% more chromosomal material than their Y-counterparts and hence they can be separated by sedimentation or centrifugation. The method has been reported to be successful in the separation of human sperms. However, it is difficult



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## Sex Pre-Selection: Ancient Notions

As early as the fifth century B.C., the Greek philosopher Anaxagoras contended that the sperms from the right testicle produced sons while those from the left were responsible for daughters. Tying off the appropriate testicle before coitus would thus ensure foetus of the desired sex. This notion persisted till the 18th century. Aristotle believed that imagination of the mother might often determine the sex of the unborn child. It was suggested that a mother desirous of a son should lie on her right side after conception (because sons were supposed to be developed in what was believed as the right horn of the two-horned uterus), drink hisop and saffron in a glass of malanga and think strongly of a male.

Similarly, theories dealing with timing of intercourse put forth by Greeks were accepted until as late as 1898. An unripe ovum was believed to produce a female, the ripe one a male. Hence, conception soon after menstruation was believed to yield a daughter. As a corollary of this hypothesis emerged the nutrition theory which believed that ripeness of ovum depends upon nutrition. Hence, a high protein diet would enhance chances that would beget son. (Lots of sweets would get a daughter.) The empress of Russia was one of the many, who tried this method and failed.

For centuries, patriarchal societies the world over have tried all kinds of gimmicks to ensure a male child. They include:

- conception at the time of full moon

and with a cold wind blowing

- conception before midnight
- drinking lion's blood
- intercourse in north wind etc
- wrapping a droning bee in the twist of dough and swallowing it
- hanging of pants on the right side of the bed by the man
- man having intercourse with his boots on
- the woman made to dress in a man's clothing before coitus

India undoubtedly has a treasure of such remedies some of which are found even in modern books. They include

- peeling a grain of barley after Ritusnana and swallowing it with water for eight days on an empty stomach
- stepping out of bed the morning after intercourse with the right foot first
- worshipping innumerable dieties from the banana tree to kali and observing fasts
- writing the Gayatri mantra and the Mahamrityunjaya, under the stars, under the pushyanakshatra on a Bhojapatra bark with a pomegranate pen dipped in saffron and washing the bark daily with holy water and drinking it during the first month of pregnancy.



to duplicate this work because of the difficulties in standardisation of these methods. Results obtained in experiments on bulls and rabbits have also been contradictory.

b) Separation by sperm motility: According to a hypothesis, the X-bearing sperm moves slower than the Y-bearing sperm since it has a greater amount of chromosomal material (and hence higher volume and specific gravity). Ericcson et al have claimed success in isolating a sizeable fraction rich in Y- sperm by passing the sperm solution through a column of bovine serum albumin. They have reported 77% success in a total of 146 cases of artificial insemination of this fraction. Ericcson, after patenting his technique, has established a chain of 24 sex selection (male) clinics. The procedure costs \$225 and 3-4 inseminations are sufficient. However, independent researchers have not confirmed the clinical results of this technique. Ericcson also accidentally discovered a sex pre-selection technique for female offsprings which is a combination of albumin filtration technique and a drug called 'clomid'.<sup>2,3</sup>

c) Separation by electrophoresis: Schroder, in 1930, subjected rabbit sperm suspension to electrophoresis (separation of ions containing opposite charges at appropriate electrodes) and claimed that he was able to collect a positively charged fraction which yielded 80% females. In 1950, Gordon achieved similar success with rabbit sperms. Though a number of other workers have failed to achieve similar results, researchers feel that by choosing optimum conditions, electrophoresis can prove to be an effective tool in separating X- and Y- bearing sperms.

d) Separation by ion exchange resins: Most attempts at separating X- and Y-bearing sperms by ion exchange resins, based on the same assumption as electrophoresis, using bull sperm on human

sperm have failed. However, a technique devised by Steono et al using resin sephadex was successful in isolating a fraction containing 90% X- bearing sperms. Adimeolija et al have also reported a fraction containing 96% X- bearing sperms. However, no clinic for female sex-preselection has yet been reported.

e) Other methods of sperm separation: Techniques like froth floatation, those subjecting the sperm to reduced atmospheric pressure, those using treatment with enzyme (like esterase, asparaginase and hyaluronidase) or a hormone (estradiol) and chemicals (sodium hydroxide and ammonium sulphate, ascorbic acid) have been reported. The results on a larger sample have not been significantly positive.

ii) Timing of insemination in relation to ovulation:

Research exploring the centuries old belief that there exists a possible correlation between the timing of coitus and the sex of offspring has yielded some results. Trials carried out on a large scale in the late 19th and early 20th century suggested that a male child is more likely to be born when insemination takes place early in the menstrual cycle. However, more recently James has tried to co-relate greater birth rate for males resulting from insemination during the latter period of ovulation with the phenomena of a lower male to female ratio among Jews than among non-Jews. He attributes this to the practice of orthodox Jews to abstain from coitus for a week after menstruation.

However, exactly an opposite hypothesis has been suggested by Shettles on the basis of results seen in animals and humans. Shettles hypothesizes that Y-bearing sperms, having slightly less nuclear material are more motile but lose fertilizing capacity earlier than their X- bearing counterparts. Hence, if



insemination occurs during early ovulation, when cervical mucus is easily penetrable by a sperm, a Y-bearing sperm is more likely to fertilize the ovum. On the other hand, insemination during late ovulation would result in the death of most Y-bearing sperms and relative abundance of X-bearing sperms and hence a greater probability of a female child.

Shettles has devised a method of sex pre-selection which includes time of insemination (within few hours of ovulation for a male offspring and 2-3 days before ovulation for a female), coital position, pre-coital douching and the desire of the female partner for orgasm. In limited samples 77-86% success in human trials has been reported. However, Guerrero points out the difficulties in the accurate anticipation of ovulation. Hence, this method may be somewhat useful in ensuring a female child. But otherwise using this method in the hope of conceiving a male child might prove "moderately effective as a contraceptive technique, but, disappointing as a sex determination method".

iii) Immunising the female with X- or Y-bearing male gametes:

The Y-linked histocompatibility (H:Y) antigen, discovered in 1950s, has been proved to be present on sperms of mouse and males of other mammals, including man. Since most of the antigen resides on Y-bearing rather than X-bearing sperm, theoretically speaking, a serum from females immunized with male cells would deactivate mostly Y-bearing sperm and hence could result in birth of a female child. However, alteration in sex ratio caused by this method is insignificant as it activates nearly 70-80% sperms. Hence, many obstacles must be overcome before this method can find any practical applica-

tion.

iv) Altering conditions in female reproductive tract:

a) Douching: Douching vaginal tract with a solution like vinegar, creating a more acidic environment is believed to yield a girl. Similarly, douching with baking soda solution is recommended for a male child. However, in-vitro studies show no difference in motility of X- and Y-bearing human sperms at different points. Moreover, any effect of mild douches is obscured by alkalinity of the ejaculate.

b) Diet: Stolkavski & Choukroun have recommended a diet rich in sodium and potassium such as sausage, meat, potatoes, bananas for six weeks preceding intercourse to get a male child. A diet rich in calcium and magnesium e.g. dairy products, eggs and greens are recommended for a female child. The diet is believed to alter the ionic balance of the mother's body as a whole and of her reproductive tract in particular. However, this theory too remains unsubstantiated.

c) Sperm count within female reproductive tract: It is postulated that increased frequency of intercourse in females, especially near ovulation, results in a higher probability of birth of a male child. A higher frequency of intercourse for a man on the other hand tends to lead to birth of a female child. Solid experimental proof supporting this hypothesis does not exist.

v) Miscellaneous:

Dr. Sharad Gogte of Bombay claims to have achieved 75-80% success in 150 cases by increasing the concentration of Y-bearing sperms using Ayurvedic preparation to be taken for 3-4 months.<sup>24</sup>



### c) New Reproductive Technologies(NRTs)

Under the umbrella concept of new reproductive technologies (NRT) various technologies have been devised. These mainly involve -

- i) Extracting eggs from ovaries of genetic mothers\*
- ii) Manipulating them and
- iii) Transferring them to suitable 'incubators'.\*\*

Some of these techniques have been successfully tried on female dairy animals. Now, these are being evolved or adopted for human females.

#### i) Extracting eggs:

These technologies involve 'recovering' eggs from ovaries of 'valuable' dead or alive females of any age.

#### ii) Manipulating eggs:

The 'recovered' eggs could be manipulated in a number of ways:

- Fertilizing them with suitable sperm and twinning them
- Using eggs of 'non-valuable' women for clones, destroying egg nuclei with laser and injecting nuclei of 'valuable' women
- Removing female genetic component from egg and injecting two sperms

into it, thus producing a child with two fathers and no mother

- 'Ectogenesis' - changing qualities like sex, color of eyes, general proportions of body and limbs and possibly facial features
- Fertilizing eggs in a laboratory in culture media concocted from bits and pieces of female reproductive tract
- Selecting the sex of the embryo by fertilizing egg with either X-bearing or Y-bearing sperm or by removing a few cells from embryo and determining the sex and then discarding embryos of 'undesired sex'

#### iii) Transferring embryo:

The 'manufactured' embryos could then be subjected to any of the following operations -

- Freezing them in a bank to be used later
- Transferring immediately into an 'inferior' woman acting as a 'breeder'/'incubator' for a full term pregnancy
- Transferring embryo first into a 'breeder' to gestate for a few months, removing foetus by cesarean section and then transferring them into 'incubators' for the remaining period of pregnancy. The breeders need not be alive.<sup>25</sup>

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\* Genetic mothers - Women whose eggs would be used for in-vitro fertilization with suitable sperms. Their characters will be inherited by offsprings.

\*\*Incubators - Women whose wombs would be useful for development of fertilized eggs during pregnancy.



## V. CONCLUSIONS

What are the possible consequences if the New Reproductive Techniques become feasible? Andrea Dwarkin envisions a 'reproductive brothel model' in which "women can sell reproductive capacities the same way old time prostitutes sold sexual ones.....". Such a model presently exists for many farm animals in which the so-called "less valuable" females are thought of and treated as pieces of machinery whose function is to pump out babies (embryos) like a sausage machine. Their life is an endless cycle of pregnancy, birth, loss of babies and insemination, remaining continually pregnant or nursing throughout their adult lives (and presumably even afterwards), while the top 10-20% of the herd considered to be "valuable" are bound in monotonous life cycles of 'genetic mothers'. Dwarkin suspects that a similar brothel model of reproduction may be in wait for human females.

But even if social institutions may be restructured in a more refined manner in future, Dwarkin's prediction cannot be outrightly rejected. In societies like ours, women and cattle shared a common legal status for centuries. Our saints equated women and the lower castes with animals in matter of receiving a thrashing from their owners. In a Hindu marriage women are equated with objects that are to be dispensed with: 'Kanyadan' is a great 'punya' - so is 'Godaan'. Women's status as a sex and reproduction chattel is supported and reinforced by law as in the case of many countries (including 37 states of the USA) where it is a man's "marital right" to rape his wife.

Surrogate motherhood as an industry is getting institutionalised. In the West, sperm banks have been in use for years. Directories containing information

about women willing to serve as breeders are being published. Lawyer and social commentators explicitly suggest that surrogacy would provide young women with an 'undemanding career' and that a sufficient number of child bearers can be easily raised especially from third world countries, at lower rates. Such mothers need not even be healthy. The Warnock Commission providing guidelines for further NRT practice and research in UK defines NRT as beneficial and the problem of ethics as "only a minor part of the whole issue". Judging by the straws in the wind, it is clear that the NRTs, in the guise of helping childless women to beget "excellent normal children" will exercise a far stricter control over women's bodies. Attempts will be made to divide women into "valuable" and "non-valuable" "beneficiaries" and "donors". Their status will be reduced to "incubators", "vessels", "breeding machines". While a small section of women (mostly from affluent societies or affluent classes of all societies) whose credentials match the requirements of scientific fathers may benefit, a vast majority of them will be pushed further down. And man will be closer to being the procreator of the species - playing God more than ever.

So where do these New Reproductive Technologies fit in, with techniques like amniocentesis?

NRTs are the most refined and advanced methods of sex pre-selection. These developments are presented as neutral, modern and scientific. Implicit in them however, are materialist and patriarchal values and sub-cultures, which are characteristic of the capitalist value system.

Those carried away by the modern &



scientific ethic, may blame the "backward" and tradition-bound psyche of third world masses accusing them of eagerly assimilating only those aspects of technologies which reinforce their cultural biases. But, it seems to be forgotten that even earlier systems had their own methods of control which effected the necessary checks and balances in society. The only difference was that those controls were more at the community level whereas today we have the monolith of Science and Technology, which is controlled by an elite, dictating choices and affecting millions simultaneously. It is this monolith which has seen the conversion of amniocentesis as a technique for detection of foetal defects into one of sex determination. These same values motivate research on sex pre-selection and NRT.

If we continue to view amniocentesis in isolation, we shall be mainly crying aloud against the medical risks associated with it. Within a few years, our objections will be silenced by the evolution of safer, more advanced techniques, which might be accepted on a still larger scale.

Ten years ago, Indian people might have shuddered at the thought of killing a four month old foetus only because of its sex. Today, the advance of amniocentesis has rendered it a more or less accepted fact. Tomorrow, pre-selecting the sex of the foetus might become a norm.

The practice of sati has plagued our past, and bride-burning and dowry murders our present. But, now, we find ourselves on the threshold of a future age where the right of life stands in danger of being seized from a woman even before birth, through the new technologies.

Though the older days of female infanticide - by either applying poison on the

mother's nipple or putting the placenta over the infant's face after birth - aren't far behind, these modern new technologies with their widespread and dangerous implications, have already begun spreading to the remotest corners of the land.

In a country where food, water, sanitation and minimum health standards are not guaranteed to women, techniques of sex-determination that lead to high percentages of abortions, thus being both dangerous and discriminatory, have received unprecedented social sanction.

So, where do we go from here?

The answer is not an easy one. It lies within the changing of attitudes linked to the issue of women's status and rights in society. Attitudes can change only when all women acquire equality in all spheres of life.

But what happens now, immediately?

Amniocentesis may soon be used on a much more extensive scale, possibly even under state patronage and protection. Once it becomes common practice, it is a step nearer to becoming an established custom.

Even if we assume for the sake of argument that sex-determination tests, in the long-run, will not reach a scale that adversely affects the sex ratio, enough harm would have been done in the meantime.

Even today, the mean age of marriage for women is 13.7 years and the age of conceiving between 15 to 35 years, according to a report on the rural areas of Andhra Pradesh.<sup>26</sup> The picture cannot be much different in Rajasthan, Bihar and Uttar Pradesh. Our maternal mortality rate is second highest in the world, and 22% of it is due to abortion.<sup>27</sup> Even this figure shows all indications of going



higher as sample studies of the cases of amniocentesis have already shown.

So, we have a picture like this: an under-nourished anaemic village girl gets married at the age of 13-14 years and is thenceforward subjected to drains of S.D. - conception, sex determination, abortion, conception, delivery, sex-determination - for the next 20 years of her life. The stresses and strains of a toiling life without the bare minimum of health services only paint the picture blacker.

Widescale and indiscriminate use of amniocentesis will also pave the way for sex pre-selection and NRTs - more drastic anti-women techniques. Such techniques will only put more controls over women's bodies and lives. Urgent legal measures to halt this chain reaction are necessary.

The argument that a legal ban may force S.D. clinics to go 'underground' and make the phenomenon more difficult to monitor does not hold. Some underground clinics will undoubtedly exist but their number, activity and influence can be minimised by the vigilance of activists.

Moreover, a large section of the doctors will refuse to perform S.D. tests after the legal ban. Even at present, in the course of interviews the moral dile-

ma faced by some doctors practising amniocentesis was quite evident. They admitted that they would accept a legal ban in toto, if it comes into existence.

The use of S.D. as a family planning measure, should be opposed firmly. Although family planning might be ultimately desirable for women, it cannot be achieved at the cost of their health, self-respect, dignity and control over their bodies. Activists in the field of human rights, people's science and movements, development and health agencies must join hands with women's groups in this fight to curb this sexist bias in our society, and to curb the power of researchers - technologists who are often oppressors.

For those who might consider the entire exercise as 'excessively gloomy', the warning of Renate Duelli Klein on the probable effects of NRT may serve as a stimulant for action.<sup>28</sup> " ... I think in the year 2000, we (women) could well be even poorer, in even more demeaning jobs and with even fewer rights and resources than today. And among the things we might have to fight for is the 'choice' to have and rear our own natural children. Not even this prospect is totally new for women if one looks at history but the scope in which it might occur is deeply alarming. We have to organise and gain more control - it's urgent."



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## LEGAL ASPECTS OF AMNIOCENTESIS

- Extracted from Anand Grover, *From the Lawyers Collective*, March 1985

The practice of sex-determination by Amniocentesis followed by abortion in case of a female child is not only illegal but constitutes a criminal offence and is Constitutionally impermissible.

### **Abortion - an offence:**

Until 1971, the law relating to abortions was exclusively governed by the Indian Penal Code (IPC). Under it anyone causing miscarriage is, unless it is done in good faith to save the life of the pregnant woman, liable for imprisonment for three years.

If the child has assumed foetal form, (normally after 5 months) the punishment can be imprisonment of upto seven years (Section 312).

If the miscarriage is caused without the consent of the woman, the person concerned is liable for imprisonment for life or ten years (Section 313).

If the woman dies by an act intended to cause miscarriage, the person causing the death is liable for imprisonment for ten years if it is done with the consent of the woman, and with imprisonment for life if it is done without the consent of the woman (Section 314).

Any act done with the intention of preventing a child from being born alive or causing it to die after birth, unless it is done to save the life of the mother is punishable with imprisonment of upto life (Section 315).

### **Medical Termination of Pregnancy:**

The Medical Termination of Pregnancy (MTP) Act enacted in 1971 modified this position radically. Its effect is to legalise abortions provided they are carried out under conditions specified in the MTP Act. As Sections 312, 315 and 316 IPC have not been repealed, an abortion not covered by the MTP Act would still amount to an offence under the IPC.

Pregnancy under the MTP Act is allowed to be medically terminated:

- a) if it is less than twelve weeks on a certificate of one registered gynaecologist and obstetrician;
- b) between twelve and twenty weeks on a certificate of two registered gynaecologists and obstetricians;

If

- i) pregnancy would involve a risk to the life of the pregnant woman or cause grave injury to her physical or mental health;
- ii) there was a substantial risk that the child if born would suffer from physical or mental abnormalities so as to be seriously handicapped;
- c) at any time on a certificate of two registered doctors, if it is immediately necessary to save the life of the pregnant woman.



Anguish either caused by pregnancy because of rape of a woman or caused by a failure of contraception by a married woman is presumed to constitute grave injury to the mental health of a pregnant woman.

All abortions carried out require the consent of the woman.

Under the MTP Act, all abortions after

twenty weeks are illegal.

#### **Sex Determination Illegal:**

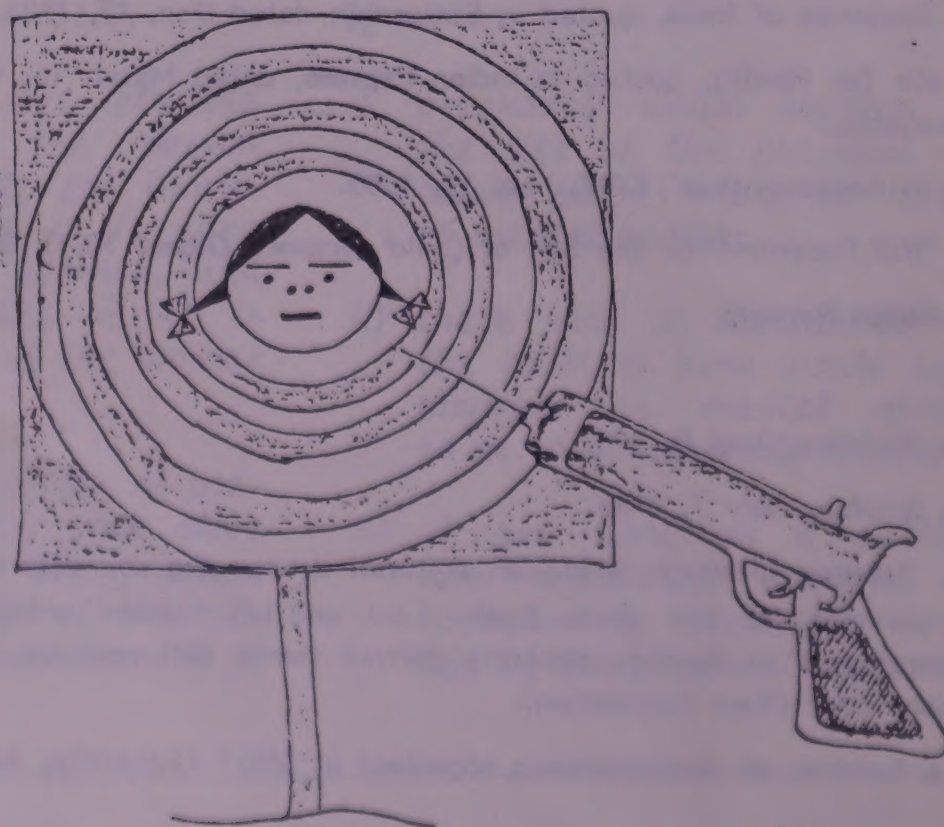
Abortion, following a proper sex determination test, would fall foul of the MTP Act as it would be outside the 20 weeks period. In order to avoid this, a lot of doctors simply do not culture the cells for three weeks.

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